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Office of Nuclear Reactor Regulation
Attn: J. F. Stolz, Chief
Operating Reactor Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Stolz:

Three Mile Island Nuclear Station Unit 1 (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
Long Term Corrosion Test Program

This letter provides the quarterly update on the long term corrosion test program, as well as recent results of destructive examinations of tube specimens. The operational cycling phase of the test program was completed in mid May. All specimens were examined in accordance with the normal non-destructive techniques, and destructive examinations are now in progress.

As you are aware, specimens used in the long term corrosion program are actual TMI-1 tubing removed from the steam generators and exposed to one of four simulated operating environment test loops. All four test loops had chlorides and fluorides at the maximum permitted concentrations (by plant chemical specifications). Loops two through four had sulfur (measured as sulfate) at its maximum limit, maintained by the addition of sodium sulfate. Loop one maintained sulfur (measured as sulfate) at its maximum concentration through the addition of thiosulfate (the known contaminant responsible for cracking). In addition, only specimens in loops three and four have been hydrogen peroxide cleaned; specimens in loops one and two thus have higher than typical levels of residual sulfur. Loop one is atypical of actual RCS conditions in terms of both chemistry and residual sulfur.

Testing completed to date for the specimens from the test loops has included all non-destructive examinations, destructive examinations of "C" rings, and more detailed electron microscopy examinations of tube specimens from loops one, two and three. In specimens from loops two through four, no evidence of crack initiation or crack growth has been identified. Electron

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microscopy examinations conducted June 29, 1984, on one tube specimen from the first loop identified a crack which had not been noted earlier. Previous eddy current examinations by Westinghouse had noted an anomalous signal in that area since the second simulated operating cycle, although analysts at the laboratory felt it was not a crack. Neither the other lead test specimen in this loop, which contained a known defect, nor any of the C-rings in this loop, had shown any new or continuing damage. The decision was made to allow the test to continue running and observe the eddy current signature of the anomalous indication to watch for any additional changes.


As a consequence of the June 29 test results, GPU initiated a reexamination of the corrosion test program eddy current tapes by independent analysts inspecting the TMI-1 steam generators. The analysts also reviewed all other record tapes of the tube from which the specimen was taken. Close examination of an early 4x1 absolute probe inspection tape (developed as part of an unrelated test program) identified a small indication in the area which is now the test specimen. It was concluded that a small defect was present in the tube before the corrosion test program was begun, but that it was below the threshold of detectability for the .540 probe. The independent analysts' review of the corrosion test program tapes indicated that this defect provided a detectable signal by the .540 probe after HFT and two cycles. Over the next three cycles, the ECT signal grew in amplitude. The preliminary interpretation of these data is propagation of a pre-existing crack. When the test program was complete, and the tube specimen was examined, the crack was through-wall radially for approximately one half inch circumferentially, and partially through wall (20-50%) for an additional half inch.

From the evidence available to date, it can be concluded that the thiosulfate environment in loop one has a sufficiently high concentration of reduced sulfur species to propagate pre-existing cracks in tubing that has not been chemically cleaned. However, the absence of cracks in C-ring specimens indicates that these levels are not sufficient to cause crack initiation on uncracked surfaces.

These results corroborate the effectiveness of GPU's corrective actions to prevent recurrence of the sulfur attack of the steam generator. The conditions in loop one are prevented in the RCS by the removal of thiosulfate from the plant, the chemical cleaning of the steam generator tubing, and by employing analytical techniques which permit analysis for both reduced and oxidized species of sulfur.

GPU's assessment of the final metallographic tests is continuing. Additional information will be provided to you as available.

Very truly yours,



R. F. Wilson
Vice President

Technical Functions